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Established 1859 Pioneer of the Gas Industry

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WHOLE NO. 3320.

NEW YORK, SATURDAY, MAY 16, 1925

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Index to Contents, Page 4 Advertising Index, Page 30

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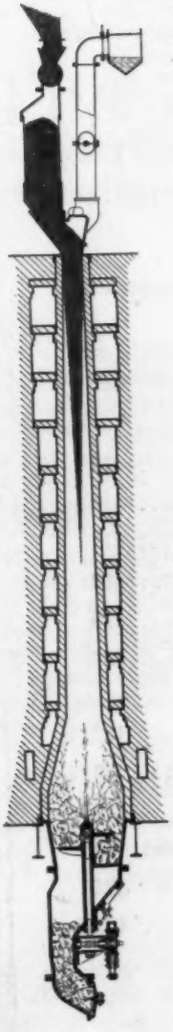

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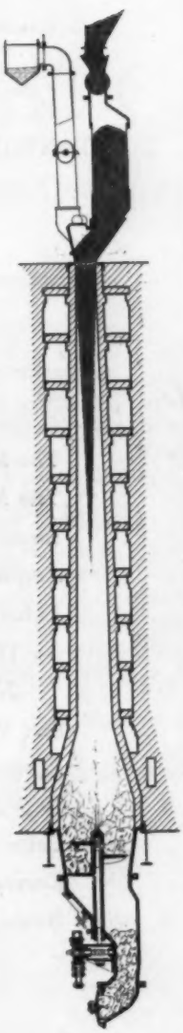

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SIXTY-SIXTH YEAR

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Contents of This Issue

The Reforming of Natural Gas—By Harry L. Masser **413**
The Manager and Public Relations—By Allen T. Early **415**
Ideas for the Man Who Sells—By William H. Matlack **417**
Accidents with Gas **418**
Industrial Gas Lesson No. 70 ..... **419**
As The Journal Sees It **421**
Natural and Manufactured Gas
Gas Wrinkles **422**
Progress in Gas Technology **423**
1925 Sales Service **424**
Catechism of Central Station Gas Engineering, 70th Installment **425**
Current Market Prices **432**
News of the Gas Industry **433**

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AMERICAN
GAS JOURNAL

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The Reforming of Natural Gas

A discussion of the principles and results of practical operations

Harry L. Masser

Gas Engineer, Los Angeles Gas & Electric Corporation

THE "reforming" or "cracking" of natural gas is a process of much interest to several of the Southern California gas utilities. It is now the practice in Los Angeles and in Santa Barbara to serve a mixed gas composed in part of natural gas and the balance of artificial gas. During the major portion of the year there exists an abundance of natural gas more than sufficient to provide for mixing of requirements. In this period, the artificial gas portion of the commercial mixture may be manufactured by "reforming" natural gas rather than by producing this gas from oil. The reforming process is vastly more efficient thermally than is the oil gas process, as is indicated by the following figures taken from typical operations of Los Angeles Gas and Electric Corporation.

Comparative B.t.u. Efficiency of Oil Gas Manufacture and Natural Gas Reforming for the Production of One Thousand Cubic Feet of 570 B.t.u. Gas

		Gallons	B.t.u.
Oil Gas			
Oil used for Gas Making		7,108	1,050,800
Oil used for Heating Generator		1,400	207,200
	Total	8,508 Gals.	1,258,000 B.t.u.
		Cu. Ft.	**B.t.u.**
Reformed Natural Gas (1,200 B.t.u.)			
Natural Gas used for Gas Making		535	642,500
Natural Gas used for Heating Generator		200	240,000
	Total	735 Cu. Ft.	882,500 B.t.u.
Excess B.t.u. in Oil			375,500 B.t.u.
Percent excess			42.5%

Accompanying this economy on a heat unit basis, there is, in Los Angeles, a further saving due to the somewhat lower price of natural gas as compared with oil upon an equivalent fuel value basis. In view of these efficiencies and economies, it has been the regular practice of the two utilities in Los Angeles since about 1917 to manufacture as much as possible of the required volume of artificial gas by reforming. This economy is, of course, recognized by the Railroad Commission, and present gas rates reflect the benefit to the consumer.

Operation of Process

The reforming process is carried on in the regular type of straight shot oil gas generator, without any important change whatsoever in construction. The operation of generator is practically the same as for oil gas production, and it is therefore possible to change from oil to natural gas at any time, according to the local requirements of the natural gas supply. The cycle of operation at Los Angeles Gas and Electric Works is ten-minute heat period and twenty-minute make period. There is about a half-minute period of blowing stack gases to the atmosphere, and a two to three-minute purge. About half a minute is required to transfer blast gases to

the waste heat boilers. No steam is used during the gas making period, the CO present in the gas coming principally from steam leakage into the machine and from some reduction of CO_2 in the presence of an excess of carbon.

The series of tests here reported were conducted at the No. 3 Plant of Los Angeles Gas and Electric Corporation during the period of May 20th to June 26th, 1924, using three of the 27 x 43-foot double shell generator sets, carrying the full city load in the normal manner. The B.t.u. quality was varied, however, between 550 and 750 B.t.u. per cubic foot of reformed gas. The commercial gas mixture was maintained at 850 B.t.u. by variation of the amount of natural gas mixed. Careful observations were made of quantities of gas used for generator fuel, and for gas making, and of the volume of reformed gas made. Deduction was made from the fuel gas used to cover fuel for standby. Operating hours per generator shell were also noted, in order to determine capacities. Careful determinations were made of B.t.u. values, chemical gas analyses, specific gravities, naphthalene and carbon.

Reforming Similar to Cracking

The process of "reforming" of natural gas is in many respects similar to the "cracking" distillation of petroleum oils. The natural gas used in these tests was principally a "casing-head" gas obtained from Santa Fe Springs and Signal Hill, having the following general analysis:

Chemical Composition of Natural Gas Used for Reforming

CO_2	1.9%	
CnH_2n	0.7	
O_2	0.1	B.t.u. 1,208
CO	0.0	
CH_4	66.8	Spec. Grav. .708
C_2H_6	29.5	
H_2	0.0	
N_2	1.0	

In this process the methane and ethane are partially decomposed into carbon and hydrogen, with an accompanying increase of volume and reduction in heat value per cubic foot. The extent of the decomposition of the natural gas varies with the generator temperature and the time of contact of the gas with the hot brickwork. Therefore, with constant temperatures within the normal operating range of the generator, the quality of the reformed gas made varies with the rate of introduction of natural gas into the machine; further, the capacity of the machine increases with the higher B.t.u. quality, as the natural gas is injected at a higher rate per hour to obtain a shorter period of contact with hot brickwork, and a correspondingly lesser decomposition. Tests at the Santa Barbara plant of Southern Counties Gas Company, reported by Mr. J. R. McLaughlin, indicated that with the introduction of air with the "make" gas, the generator capacity was increased and the percentage of fuel gas per thousand cubic feet reformed gas made decreased. It was also noted that with the cutting off of the air supply the generator tended to run cold and decrease correspondingly in capacity. An analysis of the reported Santa Barbara tests indicates there was doubtless a deposit of carbon in the machine which was partially consumed by the added air. This condition is apparently confirmed by a study of thermal efficiencies. The total B.t.u. of the reformed gas made, in some cases, exceeded the total B.t.u. of the "make" gas entering the machine. The combustion of the excess carbon with the introduction of air kept the machine hot and maintained its capacity.

Primary Decomposition of Natural Gas

The primary decomposition of the natural gas on contacting with the hot brickwork is the breaking down of the ethane C_2H_6 which is less stable chemically than methane. This is indicated by analyses of reformed gases which are entirely lacking in ethane, while methane is still present in large percentages. While ethane is the less stable of the two hydrocarbons, it requires the greater amount of heat to completely decompose it. This decomposition doubtless proceeds in two stages, first forming methane, which is then subject to decomposition in the same manner as the other methane originally present in the gas. The decomposition may be represented by the following equations:

$$C_2H_6 + \text{heat} = CH_2 + C + H_2$$
$$CH_4 + \text{heat} = C + 2H_2$$

The heat required for forcing these decompositions to completion is equal to the heat of formation of methane and ethane, and may be computed from combustion equations, knowing the heats of combustion of the products:

$$CH_4 + 2O_2 = CO_2 + 2H_2O$$
$$-X + O = -94{,}300 + 2\,(-68{,}300) + 213{,}800 \text{ calories}$$
$$X = 17{,}100 \text{ calories.}$$

$$C_2H_6 + 3\tfrac{1}{2}O = 2CO_2 + 3H_2O$$
$$-X + O = 2\,(-94{,}300) + 3\,(-68{,}300 + 370{,}440$$
$$X = 23{,}060 \text{ calories.}$$

Converted to a basis of one thousand cubic feet, there would be required to decompose one thousand cubic feet of methane, 85,900 B.t.u., and for one thousand cubic feet of ethane, 115,000 B.t.u. These figures permit making a rough estimate of the theoretical amount of heat required in the chemical reactions of the reforming process when the gas analyses are known.

A Typical Example

As a typical example, the manufacture of 600 B.t.u. reformed gas may be studied. The tests of May 23, 1924, indicated that the production of one thousand cubic feet of this quality required treating of 547 cubic feet of natural gas. It may therefore be assumed that 54.7% of each of the natural gas constituents

(Continued on page 428)

The Manager and Public Relations*

His privileges and responsibilities and opportunities for building good will

Allen T. Early

Illinois Power & Light Corporation, Collinsville, Ill.

IN the present day scheme of centralized management, a very definite public policy seems to have been established and this policy is passed down to the local managers in the field with the admonition that they, being the contact point between the company and the public, are largely responsible for the creating and maintaining of a friendly public attitude toward the company. The managers are urged to tell to the public the story of the utility company, its policies and its problems, and to awaken the public mind to a realization of the fact that the company, regardless of its size, is not only a most valuable and vital asset to the community, but an honest, conscientious and faithful servant as well. The story told to the public by the local managers is not new, but is largely a word-picture of his daily work and problems presented in a way, and with the thought, that it might lead to a better understanding. There is another story the local manager can tell, not to the public, but to the industry he serves, of his daily work and problems in connection with public relations. From such a story information may be gathered which may lead to a better understanding of each other's problems by both the central management and the local managers.

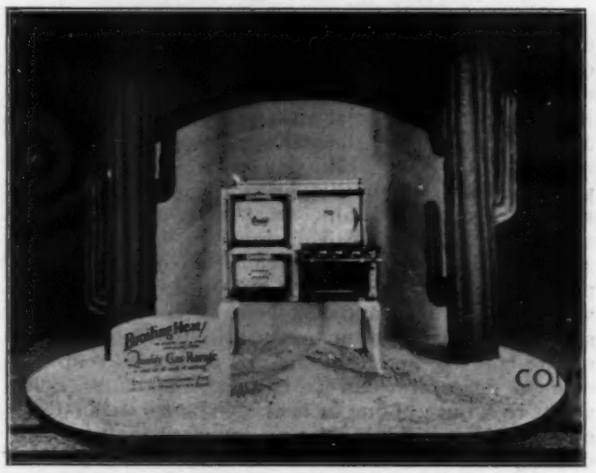
Qualifications for a Successful Manager

First, let us consider the qualifications necessary for a successful small town manager. I say small town manager because in the larger towns or cities the local organization is somewhat similar to the central organization in that the manager directs his operations from the rear and maintains his general contact with his people through subordinates to whom such responsibilities are delegated. The manager of the small property must be what is commonly known as a jack-of-all-trades. He must know enough of the distribution system and its troubles to properly direct his men in their work so that it will be done in a manner to meet the approval of a distribution expert who regards the construction, maintenance and operation of the lines as the most important duty of the manager. The intricacies of the meter and its operation must be mastered by the manager if he would train his man and conduct that department to the satisfaction of the Meter Department whose director maintains that this phase of the business is of the uttermost importance. As a merchant the manager must possess certain ability in two directions. He must be able to maintain and properly safeguard a stock of supplies for company use and for resale, adequate to his requirements, and to keep in mind the fact that this non-productive investment must be kept at a minimum. A thorough knowledge of the merchandise offered for sale as well as certain sales ability is also required of him. No high pressure sales organization of today is going to let the local manager overlook the fact that his reputation as a small town operator is based upon anything other than his volume of sales.

The Manager and Public Relations

In the matter of public relations, the manager finds himself in a vastly different situation from the one that confronts him in any of his other duties. By both study and experience he can acquire the knowledge necessary for these other duties, but unless he has certain personal qualities and traits he may never be able to secure for the company or himself that public confidence which is so essential to the success of both. And so, the qualifications of the manager who is to be successful in his public relations are as much, if not more, a matter of character as of intimate knowledge of the business.

To the honest manager, public relations becomes a privilege rather than a problem. To be honest, according to Webster, one must be upright, sincere, frank or open, honorable, just, righteous, chaste, equitable and fair. And only to the extent to which the local manager can be measured by this definition of honesty can he be trusted to safeguard the company's interests with the public. To build for himself a reputation as a clean firm, straight-shooting individual is to lay the foundation for a contact with the public of which he need have no dread and which will make a real pleasure of this phase of the work.



A Window Exhibit in Which the Attention Is Centered

*Presented before the 1925 Joint Convention of Illinois Gas Association (21st Annual Meeting).

Personal Development

In addition to a respected position in his community, the manager must give attention to the development of certain personal traits, as well as the elimination or control of others. Enthusiasm for his work and absolute confidence in his company and its policies are requisites of the successful manager. His enthusiasm must be based upon a thorough understanding of the monopolistic nature of the business and the altruistic spirit with which it is surrounded. He must guard against any bigoted tendencies and must maintain an open mind in the most trying and irritating situations. Tact, courtesy, firmness, courage, a sense of humor and a knowledge of human nature are all elements which enter into the qualifications of the local manager, and he must cultivate these qualities if he would succeed. Add, if he can, a cheerful countenance and a personality which makes friends of acquaintances and the manager can approach his public relations problem without fear.

Every manager realizes that the public attitude toward the company means much to him as an individual as well as an employee. Happiness and contentment are essential to satisfactory work and no manager desires to live and work in a community which is antagonistic to either himself or his company. For this reason every manager is ever watchful and quick to forestall disturbing influences. He fully appreciates the fact that the public relations cannot be given periodic attention or neglected until it becomes upset. Unlike a unit of plant equipment or a section of line which, although in a damaged and dangerous condition, may be kept in operation throughout a period of stress or until an opportune time for repairs, the public relations must be kept in repair for any periods of stress.

Must Depend Upon Own Ability

In the public relations work the manager finds himself almost entirely dependent upon his own ability or resourcefulness. The central organization can render assistance to a certain extent in cases of disturbed public relations, but, because of their lack of intimate knowledge of the temperament and undercurrents of each individual community, the problem becomes one for the man in the field. Advice and support can be given the manager, but, if he is interested in his continued usefulness to the company in that community, he must correct the disturbed relations without the public realizing that outside elements have been injected into the situation. Public dissatisfaction may be continued to a point where the manager is no longer able to cope with the situation and intervention becomes necessary. Such a situation may result in the dismissal of the manager. Although such action may not be deemed necessary, nevertheless the manager must admit to failure in one of his important duties. Recognizing that every public controversy may lead to disaster to both himself and the company, the manager devotes his energies toward fortifying the company's position in the community, so that discontent, dissatisfaction, prejudice and distrust may be forestalled if not eliminated.

Must Practice What Is Preached

No amount of talking will convince a public of the fairness of its utility company unless the manager, in his daily contact with the individuals of the community, proves that the company practices exactly what it preaches. To successfully demonstrate to the public the sincerity with which the expressed policy of the company is carried out, the manager must fully appreciate his responsibility for the performance of certain very definite obligations.

Many are the ways in which the manager carries out the daily details of his public relations work. Opportunities for building public good will are so numerous that the manager who is driven, not by a sense of duty, but by the true spirit of service, grasps them unconsciously and without a realization of their occurrence. In no phase of our business is it more true than in the public relations that it is the little things that count most. The manager who fails to appreciate their importance or overlooks them in his quest for the larger opportunities for molding public opinion will inevitably meet with defeat.

Using the Local Organization

The local organization is one of the most effective means by which the manager can send forth his message to the public. Every employee has his or her circle of friends. Their homes are usually scattered to such an extent that they are members of many neighborhood groups. To their neighbors and friends they are known as employees of the utility company and are often asked for information or explanation of some phase of the business. Even though information is not solicited it is only reasonable to assume that, in their groups, the conversation often turns to shop talk, and it is quite possible that newly formed impressions of the utility company are carried out from these gatherings. The only assurance the manager may have that the story of the company carried to the public by his employees is a true presentation of its policies and aims, is the knowledge of their loyalty to their own organization and of their desire to make it a perfect agency of service.

Training the Employee

Training the employees to understand the necessity of friendly public relations is not a difficult task but is unquestionably one for the manager. To neglect it is to expose the organization to the sin of hypocrisy and no greater calamity can befall it. The idea of an unselfish desire to render thoughtful and conscientious service implanted in the heart of every employee will, as it develops, solve many of the

(Continued on page 427)

GAS MERCHANDISING

Domestic – Industrial

Ideas for the Man Who Sells

William H. Matlack

W. FRED EVE, who has charge of appliance sales down in Augusta, Georgia, is following up a saturation survey made by his company last fall by sending out house-to-house solicitors. Before sending the men into the territories to call on non-users, Mr. Eve writes each of the home managers visited by his men the following letter:

My Dear Madam:

We are at the present time serving over five thousand families in Augusta, and regret to note that you are not among them.

Gas has so many advantages over other fuels, particularly in the home, that we are anxious to explain how easy and reasonable it is for you to secure this service.

Our representative will call on you in a few days, and we will appreciate your giving him an opportunity to explain our service.

Hoping the interview will result in our numbering you among our customers,

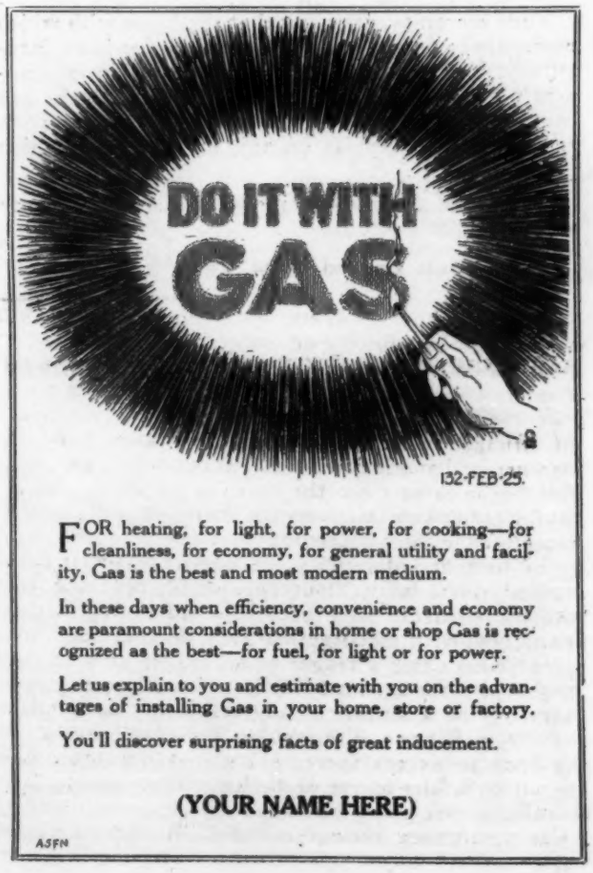
Respectfully,

This is a mighty fine way to introduce the salesman and to exploit gas service. Frequently, when canvassers are sent into the field without introduction, most of their time is taken up in telling folks who they are, why they call and what is expected of them. This letter of introduction, as it might be called, overcomes all this, and when the salesman gets into the home he may at once get down to business.

A SERVICE FOR NEWSPAPERS

THE Meyer-Both Co., Chicago, an organization that supplies mats to newspapers all over the country, have included mats for the use of gas companies in their service.

This is a good thing for the advertising man to keep in mind and to ask the newspaper folks about, as the newspapers generally furnish these mats to their customers free of all cost and are glad to do it.


DO IT WITH GAS
132-FEB-25.
FOR heating, for light, for power, for cooking—for cleanliness, for economy, for general utility and facility, Gas is the best and most modern medium.
In these days when efficiency, convenience and economy are paramount considerations in home or shop Gas is recognized as the best—for fuel, for light or for power.
Let us explain to you and estimate with you on the advantages of installing Gas in your home, store or factory.
You'll discover surprising facts of great inducement.
(YOUR NAME HERE)
ASFN

Accidents With Gas*

DURING the eight months beginning August, 1924, the secretary's office has received 144 press clippings describing accidents to the public through the use of gas. The clipping bureau was instructed to supply us with everything in the daily press relating to gas in all Pacific Coast States, with especial stress on accidents to the public.

It is reasonable to assume that the field has been well covered and that the above number is close to the total figure. This should be considered in the light of the fact that there are over five million people on the Pacific Coast in intimate daily contact with gas in their homes and places of business.

While all accidents are deplorable, the number ascribed to the gas industry is so small that it should be a matter of pride, and this is especially true as investigation reveals that some of this total are wrongfully ascribed to gas, many are of the most trivial nature and an appreciable number are the result of wilful attempts at suicide.

A summary of these accidents classified from the clippings of the press is as follows:

Suicides	4
Suicidal attempts	5
Accidental asphyxiations (54 deaths)	50
Partial asphyxiations	43
Explosions and fires (6 fatalities)	42
Total	144

Your secretary, realizing that the haste with which newspapers prepare their copy often leads to inaccuracy, has attempted to verify the statements appearing in the press. A letter is written to the gas company upon whose lines an accident has occurred, requesting the results of any investigation which may have been made, and this is then compared with the press statement.

Unfortunately, our gas companies do not seem to be alive to the importance of studying the causes of accidents, as the returns received from these letters have been in most cases of no value. Only 31 replies have contained sufficient detail to permit of a definite conclusion being reached.

It is significant that in only six of the 31 cases was the accident reported with reasonable accuracy by the press and that in 10 instances the report was entirely incorrect and gas either had nothing at all to do with the accident or was only an accessory after the fact. The companies' statements are classified as follows:

Deaths:	
Suicides	2
Accidental disconnection of gas hose (in one case by an intoxicated person)	2
Carelessness in lighting	1
Poor ventilation	1
Deaths due to other causes, but ascribed to gas	2
Total	8
Partial Asphyxiation:	
Suicidal attempts	3
Carelessness in lighting	5
Poor ventilation	2
Other illness, but ascribed to gas	2
Total	12
Explosions and Fires:	
Carelessness in lighting	6
Looking for leak with match	1
Actual leaks	2
Other causes, but ascribed to gas	2
Total	11

*Published by the Pacific Coast Association as part of Bulletin No. 10.

GAS COMPANY CREWS TO FIGHT THE FALSE ALARMIST

So extensive has the work of gas company emergency crews in various cities of the United States become in handling suicides, drownings and even obstetrical cases that many of the larger gas companies are taking steps to deal with that perennial nuisance, the false alarmist.

"Fireless fire alarms" carry with them the heavy penalty of the law. The gas company, as a private institution, has no such protection in most cases and has to deal with the situation by other methods.

"If ever I catch a fellow who does that," said the head of the emergency crew in a large Eastern city resently, "he certainly is going to get something from me. It's not so much that we mind going out. It's because we are apt to get a real call when we are out on a false alarm, and then the one who needs us suffers."

Gas emergency crews are conducted along lines very similar to those of the average fire department. Like the employees in the gas plant, they must be on duty every hour of the day or night, ready to answer a call for help at a moment's notice.

Calls are not limited to cases of asphyxiation from illuminating gas. They come in for all reasons. Furnaces do not burn properly and coal gas starts the trouble—there is a call for help. A man repairs the engine of his automobile in a closed garage and is found apparently dead—the resuscitation crew is called; a man falls into the river, or a hospital patient fails to come out of the ether—the bell rings in its message at headquarters.

The men who do this work, all of whom are employed and paid by the gas company, are enthusiastic about it. It gives them a thrill, they say. And they look at it from a humanitarian standpoint, too. Even if the people they help are not grateful—and often they aren't—at least they have accomplished something.

INDUSTRIAL GAS LESSONS

IF IT'S DONE WITH HEAT — YOU CAN DO IT BETTER WITH GAS

Lesson No. 70

Heat and Change of State

The Fusion of Solids and the Latent Heat of Fusion

IT has been pointed out that in order to melt a solid it is first necessary to bring the temperature of the substance up to the melting point and then to apply more heat, while maintaining this temperature in order to change the solid into a liquid. For each part by weight of the solid there are required a certain number of British thermal units to raise the temperature per degree. This figure is dependent on the specific heat of the solid, which has been discussed earlier in these lessons. Furthermore, in order to change unit weight of the solid at the melting temperature to the liquid condition, there are also required a certain number of heat units. This quantity of heat is known as the latent heat of fusion. It is appropriately called latent or hidden heat, for its effect is not manifested as ordinary or sensible heat is, namely, in a rise in the temperature of the substance which is being heated. Its effect is simply to convert the solid into the liquid condition. It must be pointed out that while this change from solid to liquid condition is taking place, the temperature does not rise. Thus, for example, a freezing mixture of ice and water will be found to have a temperature of 32 degrees F. or zero degrees C.

Melting Mixture of Ice and Water

A similar condition arises when a mixture of ice and water are melting. In fact, it may be said that when ice and water exist together in a mixture, the temperature will always be found to be 32 degrees C. Similarly, when a mixture of a molten solid and the solid itself exist together in any mixture, the temperature of the system will be found to be that of the melting point. While the solid is being melted the latent heat of fusion must be supplied from outside sources, when the molten liquid is congealing, heat is being released, the same amount of heat that was first added to convert the solid into the liquid state, but the temperature of the mixture does not rise as long as any molten solid is still present in it. The heat released is simply being dissipated.

On the other hand, when all of the solid is melted and more heat is added to the molten mass, then the temperature commences to rise once again. Then again, when all of the molten solid has frozen again, the temperature of the mixture commences to decrease.

In other words, a certain amount of heat must be added to the solid in order for it to be changed into a liquid and when the liquid freezes this same amount of heat is again released, and until this heat is released or until it is added, as the case may be, the temperature of the molten solid cannot increase nor of the solidified liquid decrease.

LATENT HEAT OF FUSION
1832°F.
1
Solid Lump of Copper
1 Copper melts at 1832° F. Temperature on thermometer has just reached melting point of copper. Copper does not melt, for heat is added only in sufficient quantity to keep temperature from falling.
2 The addition of considerable heat melts the copper, for— latent heat of fusion is supplied. Temperature remains at 1832° F. as long as solid Copper is present.
1832°F.
2
Molten Copper
Solid Copper
All Copper Molten
1832°F.
1832°F.
3
— 3 —
After copper is entirely molten, and heating is continued, temperature commences to rise.
Latent Heat is Hidden Heat not manifested in temperature rise but resulting in Change of State.

Some of the Industrial Gas Equipment at the University of Illinois

No. 1—Gas compressor, pressure tank, gas meter with automatic demand and consumption attachment. This compressor furnishes gas at 20 pounds pressure for assaying furnaces. No. 2—Another view in the Heat Treating Department of the University showing some of the high-grade automatic gas-fired equipment for heat treating steel. No. 3—Gas-fired boiler used for supplying steam to the drying cabinet and for a large absorber. This is a 6 H. P. gas-fired boiler, completely automatic, which will operate without any attendance. No. 4—High pressure gas forging furnace. Forging temperatures can be reached in less than 15 minutes without noise, dirt or smoke, and the results of the heat on the metal can be watched very easily. No. 5—Two gas-fired core ovens for baking cores. The brick oven immediately behind the gas-fired ovens is also gas fired.

As The Journal Views It

NATURAL AND MANUFACTURED GAS

Natural gas was the first gaseous fuel known. Its existence antedates by far its application to useful purposes. The story runs that a Greek shepherd, herding his flock on the hillside near the town of Delphi, was accidentally overcome by emanations from the earth and was thus the first to be made aware that a gaseous substance possessing wonderful properties existed there. That such a substance should be clothed with supernatural, mysterious attributes was only natural at the time. It is now quite evident that at the oracle at Delphi, at which the priestess was temporarily overcome, rendered loquacious and supposedly prophetic, was due to her inhalation of natural gas.

It was a long time after that before Man realized that natural gas could be used for other much more important and useful purposes than to intoxicate priestesses and produce pseudo-prophecies. Today the natural gas industry in this country is one that serves the public with fuel both for industrial and domestic purposes in many communities. It is one that has developed in a large degree and that has become an important factor in the fuel world.

But it is also evident that it is impossible for natural gas always to be available in commercial quantities. It stands to reason that sooner or later the resources of our country in natural gas will become depleted. How far distant that is, is a much mooted question. But that it will come some time—and perhaps not so far distant at all—is the general belief.

Manufactured gas may under certain conditions be a competitor of natural gas, but, considered in a broad light, the natural gas industry has in manufactured gas not a contender for its business but an aid and a means of conserving its sources of raw material. The natural gas industry has recognized this fact and has already taken steps to supplement its natural gas supplies with manufactured gas. The admixture of the two seems to be a problem that is not surrounded with difficult technical conditions. The two gases mix well and the resulting product possesses properties which make it very useful for both domestic and industrial purposes. The two fuels thus can go hand in hand and practical experience has already shown that the augmenting of the natural gas supply through the agency of manufactured gas has solved serious situations in many an instance.

Furthermore, exclusive of the manufactured end of the business, and of certain phases of the distribution end as well, the problems of the natural gas industry are similar to those of the manufactured gas industry. The natural gas companies have more or less the same difficulties in building up good will and in maintaining it. The natural gas merchandising problems are very much like those that exist in the manufactured gas industry. Natural gas companies have to develop a friendly feeling in the community by giving good service and paying strict attention to their business so that adequate supplies of gas are always available; they have to take care of complaints promptly, make repairs and adjustments to apparatus efficiently, just as in manufactured gas industry. Thus it is clear from the standpoint of merchandising, public relations, rate making and also industrial applications, the two industries have much in common.

From the indications that are now available, the future of the natural gas industry is intimately interconnected with manufactured gas. Sooner or later it is quite evident that all natural gas companies, excepting of course those which have peculiar local conditions of their own, will be making manufactured gas and mixing it with the natural product. This is not in any sense derogatory of the natural gas industry, not in any sense a criticism of its position in the fuel world, but merely a fact that is dependent on natural law. And it is the wise natural gas man who recognizes the situation, as it is constituted, and makes preparations for meeting it whenever it becomes necessary to do so.

GAS WRINKLES

Wrinkle No. 6

Trenching

(Wolfe Volke, Gas Distribution Department, San Diego Gas & Electric Company)

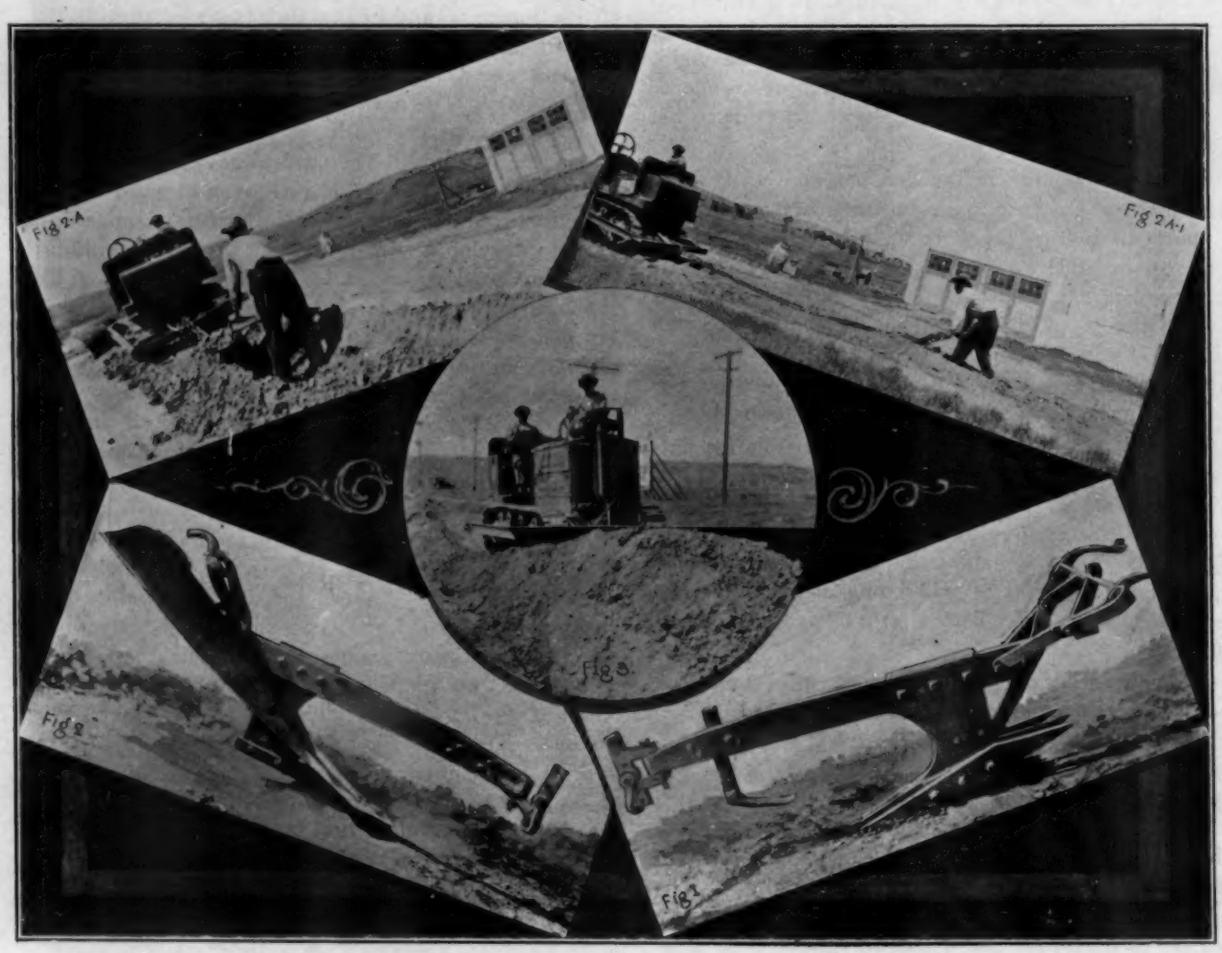
AN improved way of laying wrought iron pipe where depth is not over 24 to 28 inches is accomplished with a 45 horsepower Caterpillar and implements shown in the photographs.

Fig. 1 is the rooter which is first used. A shoe is placed near the front of the beam to keep the rooter from going too deep the first round. It is then removed and the depth is regulated by the holes in clevis bar and length of chain.

The points are 3½ feet long, 5 inches wide and 1 inch thick. They are three in number and are spaced 4 inches apart and made reversible. The beam is 7 feet long, 6 inches wide and 1¼ inches thick. The standard is 18 inches high, 15 inches wide and ¾ inch thick. The angle of the joints from bottom beam is 20 inches in front and 10 inches in the rear.

These three points cut a square bottom trench and by running the rooter back and forth through the trench four to six times a deeper trench can be made and can be shoveled out easily without picking. Most of the dirt can be plowed out with plow, as shown in Fig. 2. The plow has two mold-boards which are 7 feet long of ⅜ iron. The point is 12 inches. The plow will not clean trench completely but much time and labor can be saved.

The back filling is done by the caterpillar with a filling board specially made for this purpose.



PROGRESS IN GAS TECHNOLOGY
Domestic and Foreign

INFLUENCE OF OPERATING PRACTICE ON COMPOSITION OF CARBURETTED WATER-GAS LIGHT OIL

AS a result of examining five existing carburetted water-gas plants, relations have been established between the composition of the light oil and operating conditions in the carburettor. All plants except No. 2 were making gas of calorific value 530 B.t.u. per cubic foot, the value for the gas from No. 2 being 570 B.t.u. per cubic foot. Plants 1 and 5 produced the most divergent results. In plant 1 the cracking temperature at the bottom of the carburettor was 740-750 degrees, and the rate of oil input (gals. per min., divided by the radius of the carburettor in feet squared) was 0.4. In plant 5 the corresponding figures were 690 degrees and 1.0. Other factors were similar in the two plants. The meter of plan 1 was free from deposits and there was little condensate in the mains (0.4 gal. per 1,000 cubic foot of gas). The meter of plant 5 contained deposits and the main condensates were excessive and associated with 20 per cent of gummy material.

The light oils obtained by scrubbing the gas with paraffin oil are contrasted with light oil from coke-oven gas.

	Total unsaturation	% distilling below 140°	% distilling below 160°
Plant 1.....	5.2	96.4	98.6
Plant 5.....	23.4	80.4	89.0
Coke-oven	8.8	89.5	94.9

The oil from plant 5 was very rich in styrene and indene, and from vapor pressure data and the quantities present it was calculated that the gas would be saturated with these constituents at 5 degrees; hence the deposits in mains and meters. Low carburettor temperatures and high rates of oil supply promote the formation of styrene and indene, with resulting main and meter deposits.—(Ind. Eng. Chem., 1925, 17, 168—174).

COAL-WATER GAS GENERATOR

THIS invention relates to the manufacture of coal gas and water gas in apparatus of the kind in which one or more horizontal retorts for carbonizing coal is or are arranged to open at one end into a vertical water gas generator.

According to this invention the generator is divided and the two halves thereof with their retorts adapted to be worked alternately. In one phase steam is admitted to the generator at one side to make water gas, and this water gas mixed with rich coal gas is entirely passed to the hydraulic main. In the second phase air instead of steam is admitted to the generator to make producer gas, the main portion of which, together with a small proportion of low-grade coal gas, is passed to the combustion chamber surrounding the retorts, while the main portion of the low-grade coal gas, together with a small portion of the producer gas, passes to the hydraulic main either direct or through the horizontal retorts; the relative volumes of mixed gases passing to the combustion chamber and to the hydraulic main respectively in this phase being regulated by the pull of the chimney. The other generator and set of retorts are meanwhile working in the first phase. In the combustion chamber the gas meets the secondary air, then passes round the horizontal retorts, down to the bottom of the setting, round the water gas generator, thence to the recuperator, and on to the chimney; while the water gas on the other side either goes through the horizontal retorts to the ascension pipes hereof, or direct to separate ascension pipes. In order to increase, if necessary, the temperature of the generator which is making water gas, a portion of the producer gas from the other generator, instead of entering the combustion chamber, may be passed into flues at the side of the generator, which convey it to other flues surrounding the bottom of the water gas generator, where a separate supply of secondary air is admitted for combustion.

The preliminary heating of the setting is obtained by means of gases from an outside source—say, from the adjoining bench of retorts, or from a separate water gas plant, so that the setting will not require a producer furnace for continuously heating the retorts with carbon monoxide; and after the setting is heated, no separate blow gases are used, heat being maintained by the combustion of the gas from the generator with a small proportion of coal gas as aforesaid. Inspection doors are arranged in the outer wall of the setting opposite each of the open ends of the retorts. The primary air and steam are both preheated before entering the generator.—(British Patent No. 229,042.)

FORMS OF SULPHUR IN COAL AND COKE

IT is shown by phase-rule methods that when a sulphur complex is in equilibrium with carbon at a high temperature the sulphur appears in two forms: (a) free sulphur absorbed, and (b) sulphur in solid solution in the carbon or so held at the surface that it is impossible to separate it from the solid solution. Coke made in the laboratory by rapid heating of coal contains sulphur in three forms: (a) free sulphur absorbed, (b) as in (b) above, and (c) as FeS with some CaS and MgS; and if this coke be long heated to redness the free sulphur slowly passes over into solid solution. Coke made by the ordinary coking process contains, before cooling, sulphur in two forms: (a) in solid solution or ab-

sorbed so as to have the properties of a solid solution, and (b) as FeS with small quantities of other metallic sulphides, absorbed sulphur being either absent or in very small quantities. When this coke cools down, even with limited access of air, the FeS is oxidized ($4\ FeS + 3O_2 = 2\ Fe_2O_3 + 4S$); but when the coke is quenched this oxidation of FeS is very limited. When hydrogen or a gas containing hydrogen is led through red-hot coke, the FeS is acted upon, with formation of H_2S.—(Het Gas).

1925 Sales Service

A leaflet has been issued under the auspices of the Commercial Section of the American Gas Association descriptive of the 1925 Sales Service which has been planned in connection with the development of the National Sales plan.

There are six distinct services in all, which are tied in with the corresponding monthly plans and which cover every phase of promotional activity. They are as follows:

1.—Monthly Home Service Bulletins, consisting of four sections devoted to: (1) Brief news items and notes of current activities, (2) Stories of successful Home Service Departments, (3) Weekly radio lectures, (4) Stunts, ideas and suggestions of timely value.

2.—Monthly Bulletins for the sales force, consisting of matter prepared especially for use of salesmen: (1) Ideas, suggestions, inspiration articles, (2) Instructions for current month's sales activity. Note: Last page left blank for local imprint (standings, contests, etc.)

3—Monthly Window and Store Display Set-ups, with photos, sketches and diagrams of material for use in connection with sales drive for each month. Complete detailed instructions for set-up and use.

4.—Monthly Trade Promotion Bulletins, consisting of two series of bulletins, as follows: (1) Six issues for plumbers and dealers, (2) Six issues for architects and builders.

5.—Monthly Campaign and Sales Drive News Bulletins, reporting successful instances of sales promotion activity from the expert merchandising counselors of the service..

6.—Monthly Bulletins for the Sales Manager, consisting of concentrated "briefs" on principles and practice of: (1) "Gas" and Appliance Sales Management, (2) "Gas" and Appliance Advertising, (3) "Gas" and Appliance Merchandising.

These six services cover 24 complete sales plans with copy suggestions and each sales drive plan provides full instructions as to:

1.—Organization of Sales Drive.
2.—Calendar of Operations.
3.—Plan and Details of Management.
4.—Quotas and Sales Contest.
5.—Special Offer alternatives suggested.
6.—The Product—Copy Finding Chart.
7.—Direct Advertising Suggestions.
8.—Newspaper Advertising Ideas.
9.—Window and Store Display Directions.
10.—Coverage Plans for Canvassing Work.

The additional new and important feature which has been added to this year's service and which is especially valuable for small gas companies is a free consultant and informative service on the following suggestions:

1.—Sales Organization and Management.
2.—Compensation and Sales Quotas.
3.—Hiring and Handling Sales Crews and Men.
4.—Newspaper Advertising (constructive criticism).
5.—Direct Advertising (review, analysis, suggestions).
6.—Window and Store Display (ideas and comment).
7.—Lectures and Demonstrations (suggestions).
8.—Solicitation (store, house, telephone methods).
9.—Equipment-Servicing (inspection, adjustments).

CAREER FOR WOMEN IN GAS COMPANIES

A new profession for which women are pre-eminently fitted is rapidly developing from the home service work being undertaken by the gas companies of the country. More than 50 of the leading gas utilities have already established home service departments, and the number is increasing steadily. Each of these departments has a woman at its head, as director, with from one to half a dozen assistants, also women.

Scientific cooking and home economics, with lectures, radio talks and demonstrations, are offered to the home makers of the community by women trained in this work. Many university undergraduates have begun to prepare themselves for this career as a result of the demand for their services by the gas companies and other agencies.

The Home Economic School at Cornell University reports that 80 trained women will be graduated this year, and there are now 600 students in the school, many of whom look forward to gas company work. It is estimated that by means of the Home Bureau of the school about 65,000 women have received instruction through extension work along these lines.

Happier, healthier homes, with less household drudgery, with better food and more leisure, are the results sought for by the Home Service Departments, with special reference to the efficient use of gas for cooking in the home.

Catechism of Central Station Gas Engineering in the United States

Installment No. 70

(Continued from last week)

Saturation Problem

340. What effect does the saturation of a gas with one vapor have upon the amount of other vapors that can be carried by the gas?

Ans. The effect produced by the saturation of a gas with one vapor upon its power of carrying other vapors depends upon the tension of the vapors in question, and upon the mutual solubility of the liquids from which the vapors are derived. Regnault's experiments prove that "when two liquids exert no solvent action on each other, the tension of the vapors which rise from them is nearly equal to the sum of the tensions of the two separate vapors at the same temperature; while with two liquids that partially dissolve each other, the tension of the mixture is much less than the sum of the tensions, being scarcely equal to that of the vapor with the higher tension; and with liquids that dissolve in all proportions the tension of the mixture is intermediate between the tensions of the separate vapors." From these laws it is seen that a gas may be saturated with a vapor without any interference with its capacity for carrying the vapors of liquids which are not soluble in each other, or in the liquid from which the first vapor is produced, since, as these vapors are added to the gas, the tension increases by the amount required to keep them from condensing. If, however, the vapors are from liquids which are soluble in each other, saturation of the gas by any one vapor reduces the capacity for vapors with higher tensions, since the increase in tension due to the addition of the new vapor is not sufficient to make the combined tension as high as would be the tension of the second vapor, if it existed in the gas alone. On the other hand, saturation with a vapor increases the capacity of the gas for vapors of lower tensions as long as the liquids from which the vapors are produced are soluble in each other, since the mean tension of the mixture of the vapors will be higher than that of the vapor of lowest tension, and, therefore, more of this vapor can be carried by the gas. Conversely, the addition of a vapor of very high tension to a gas already saturated with a mixture of vapors of low tension, all the vapors being those of liquids mutually soluble in each other, will slightly increase the capacity of the gas for carrying the low tension vapors, while the addition of a vapor of low tension to a gas saturated with vapors of higher tensions, will decrease the carrying capacity for these higher tension vapors.

Definition of Horsepower, Etc.

341. What is the meaning of the term horsepower as applied to steam engines? What is indicated horse-power? What is effective horse-power?

Ans. Horse-power, as applied to steam engines, is the unit of power by which is measured the quantity of work done, or of energy transformed, in the unit of time. In other words, it is a measure of the rate at which work is performed. Its value in British units is

500 foot-pounds per second, or
33,000 foot-pounds per minute, or
1,980,000 foot-pounds per hour.

Indicated horse-power is the work, expressed in horse-power, performed per minute by the steam upon the piston of an engine and is calculated from the mean effective pressure per square inch of piston shown by an indicator diagram, or diagrams, taken while the engine is at work. It is therefore the work done by the steam in the cylinder of a steam engine.

Effective horse-power is the work transmitted to the main shaft of an engine and thus made available for performing useful work. It is usually measured by means of a brake, and is therefore often called "brake horse-power." It is, of course, always less than the indicated horse-power by the amount of the losses, chiefly fractional, in the engine.

Determining Horsepower of Steam Engine

342. How would you determine the horse-power that was being developed in the cylinder of a steam engine?

Ans. The horse-power developed by a steam engine is expressed by the quotient obtained by dividing the number of foot pounds of work developed by the engine in any interval of time by the number of foot-pounds equivalent to one horse-power for the given time. The work developed by the engine is equal to the total pressure in pounds exerted by the steam on the piston, multiplied by the distance in feet over which it is exerted in the given interval, and can be found, taking the time as one minute, by obtaining the continued product of the mean effective pressure in pounds per square inch of the steam in the cylinder, the length of the stroke in feet, the net area of the piston in square inches and

the number of strokes per minute. The product is then divided by 33,000. The rule may be expressed in the following formula: H. P. $= \frac{2\,plan}{33{,}000}$ in which

P = Mean effective pressure of the steam in pounds per square inch.
L = Length of stroke in feet.
A = Net area of piston in square inches.
N = Number of revolutions per minute.

The mean effective pressure may be determined exactly by the use of an indicator, which is an instrument used to measure and register continuously and simultaneously the conditions of pressure and volume of the working fluid existing in the cylinder of a heat engine at work.

Construction of the Indicator

The indicator consists of a cylinder containing a piston working against a spring. Attached to the piston is a rod with its head so connected to a lever that the motion of the piston is multiplied and transferred to a pencil holder, the path of which is kept parallel to that of the piston by means of some form of parallel motion. A pencil placed in this holder can be brought into contact with a sheet of paper wrapped around a drum made to turn about its axis with a reciprocating motion by a cord wound around its base and connected to the proper point on a "pantagraph," or other form of "reducing motion," attached to and moving with the crosshead of the engine; which cord works in opposition to a spring fastened to the drum.

From the indicator cards obtained from both ends of the cylinder the mean effective pressure is found by determining the area enclosed by the diagram in each case. Dividing this area by its length the mean height is obtained, and this multiplied by the scale corresponding to the spring employed gives the mean effective pressure in pounds per square inch.

In the absence of any indicator cards from which to determine exactly the mean effective pressure of the steam it will be necessary to calculate this approximately from the boiler pressure and the point of cut-off, making a proper allowance for the back pressure. If the point of cut-off is not known it can be determined quite closely by opening the drip cocks on the cylinder, cracking the throttle valve and turning the engine slowly backwards by hand. The point of the stroke at which steam is first admitted to the cylinder when the engine is thus moved backwards will be shown by the steam beginning to escape from the drip cock, and this point, which can be obtained quite exactly by two or three trials, is obviously that at which the admission of steam is cut off when the engine is running. Knowing the point of cut-off and the initial pressure, which, if the steam pipes are covered and properly designed as to size, may be taken as from five to ten pounds less than the boiler pressure, according to the distance of the engine from the boiler, the mean pressure on the steam side of the piston can be obtained from steam engine tables. If the exhaust pipe is large and without sharp turns the back pressure should not exceed from three to five pounds, so the mean effective pressure will be obtained by deducting, say, five pounds from the mean steam pressure.

Calculating the Horsepower

Knowing the initial pressure of the steam in the cylinder and the point of cut-off, an ideal indicator card may also be constructed from which the mean effective pressure can be calculated.

The number of revolutions made per minute can be obtained by a count when the engine is working under its load. All the factors being then known, the horse-power developed can be calculated in the manner explained above.

It must be understood that the horse-power thus calculated gives approximately the horse-power developed in the cylinder, namely, the indicated horse-power of the engine. The actual work which the engine is capable of doing is called the actual or brake horse-power, and is less than the indicated horse-power, the difference being the power required to overcome the friction losses in the engine. The friction of the moving parts of the engine is too uncertain for estimate when the size of engine is unknown.

An Example

As an example, assume an engine with a stroke of 12 in. and a net piston area of 100 sq. in. making 100 revolutions per minute with a steam pressure by gauge of 100 lb. at the boiler. With a loss of 5 lb. between boiler and cylinder the initial cylinder pressure will be, say, 95 lb. The point of cut-off is determined to be at one-quarter stroke. Then from the tables we find that the mean absolute pressure of steam expanding according to Mariotte's law to a volume four times its original volume is equal to the initial absolute pressure multiplied by 0.597. Absolute pressures are pressures measured from a perfect vacuum and the equal to gauge pressures plus the pressure of the atmosphere, which is commonly assumed as equal to 14.7 lb. The initial absolute pressure in the assumed case is therefore $95 + 14.7 = 109.7$ lb., and the mean absolute pressure is $109.7 \times 0.597 = 65.5$, so the mean pressure as measured by a gauge would be $65.5 - 14.7 = 50.8$ lb. From this must be deducted the back pressure, assumed to be 5 lb., leaving the mean effective pressure 45.8 lb. The factors then are:

P = 45.8, L = 1, A = 100, N = 100 and the approximate indicated horse-power is:

$$\text{H. P.} = \frac{2\times 45.8\times 1\times 100\times 100}{33000} = \frac{96.1\times 10000}{33000} = \frac{916000}{33000} = 27.7.$$

(Seventy-first Installment Next Week)

THE MANAGER AND PUBLIC RELATIONS

(Continued from page 416)

manager's public contact problems. The development of the idea is a duty which every manager assumes. Not only does that duty require him to periodically teach the principles of public contact and service, but demands that he avail himself of every opportunity to offer to his employees a practical demonstration of the effectiveness of a sincere desire to serve. How many managers, after having satisfactorily adjusted some difference with an angry, impatient or unreasonable customer, have not only failed to recognize in such an incident an opportunity for an object lesson, but have undermined the spirit of the organization by some facetious or thoughtless remark conveying the impression that something had been "put over" on the complaining customer. Few managers are guilty of such carelessness. The situation is mentioned merely to illustrate the fact that in the daily routine of the work many minor incidents can be advantageously used by the manager who is awake to their value as a means of strengthening his position in the eyes of his employees and the public.

Participation in Community Affairs

The civic and community activities of the town offer to the manager an opportunity to identify himself and his company with the progressive element of the community. While participation in these activities is desirable, yet it is not without its element of danger. In the small town the majority of civic movements are accompanied by a subscription list. The modern subscription list is prepared by a well meaning committee which established the quota expected or required of each business institution. The utility company, being recognized as one of the large industries, is assessed accordingly. And it frequently happens that the manager finds himself appointed as a member of the collecting committee. In these situations the manager thinks of his company, of the community interest and of the public attitude, and realizes that he still has his problems.

Every activity of the organization has some connection with the public relations, either directly or indirectly, and a thorough appreciation of this connection, by every member of the organization—and especially those whose work may never bring them in contact with the public—will be of invaluable assistance to the men in the field. The central organization of today is composed largely of a group of specialists to each of whom is delegated authority and responsibility for developing and directing the particular phase of the business for which he is especially selected. In devoting their entire time and energy to the efficient functioning of their respective departments they may, in the enthusiasm for their work, fail to recognize or give a thought to the existence of their own very definite part of the responsibility for the company's reputation with the public.

Correlating the Efforts of Departments

The manager, in his position at the converging point of a large majority of the activities of every department, is able to recognize very fully the extent to which each department either understands or fails to appreciate the relation of its functions both to the organization as a whole and to the public policy. To adapt all the ideas, instructions and requirements of each department to workable and successful methods of application to his particular situation requires of the manager the careful and tactful analysis of each activity, that it may not work to the harm or hindrance of other departmental requirements or be inconsistent with the public policy.

To mention briefly some of the ways in which the various departments may materially assist the manager will more clearly illustrate his viewpoint of the necessity for more thorough understanding of the field activities.

Purchasing Department and Public Relations

A purchasing department is one which, in the performance of its duties, never comes in contact with the public. And while its efficiency is based upon its success in purchasing supplies at the lowest possible cost, yet its effectiveness as a public utility agency can be viewed from the standpoint of its realization that, in certain parts of its work, it can save dimes in first cost at the expense of dollars in public relations. In small properties the manager spends much time and effort in creating a feeling among his customers that the company is a local enterprise and is interested in the success of every citizen. To support this attitude the organization should, in the purchasing of such supplies as can be secured locally, co-operate with the manager, to the end that the best interests of the company be served. Every local activity of the company is known to the community and any violation of the public's interpretation of the expressed policy of the company leads to a prejudiced discussion in the meetings of the merchants', contractors' and supplymen's associations, of the relative advantage or disadvantage to the community of a grasping foreign corporation or a small home-owned utility. When the purchases of supplies, of a kind which can be secured locally or through a local representative, is contemplated the purchasing department can prove its interest in the common cause by requesting the manager to secure quotations and advise of conditions to be given consideration, often such an opportunity affords the manager a means of strengthening his relations with influential and prominent customers or of securing settlement of slow and difficult account.

Merchandising

In the merchandising department the present tendency toward time payment methods of selling is developing another angle from which the public problem and the manager's problem can be viewed. Un-

(Continued on page 431)

THE REFORMING OF NATURAL GAS

(Continued from page 414)

per one thousand cubic feet were involved in the chemical reactions of manufacturing one thousand cubic feet of reformed gas. The following figures present analyses of natural and reformed gas reported for May 23rd, together with the ultimate analyses and weights of the reformed gas constituents and the quantities of natural gas constituents involved in producing one thousand cubic feet of the reformed gas:

Natural Gas, 1227 B.t.u.				Reformed Gas, 599 B.t.u.			
	Percent	Weight Lbs.	Ultimate Analysis Lbs.	Percent	Weight Lbs.	Ultimate Analysis Lbs.
CO_2	1.5	0.954	C 22.484	1.4	1.629	C 16.632
CnH_2n	0.7	0.028	H_2 6.504	2.1	1.556	H_2 6.618
O_2	0.1	0.046	O_2 0.740	0.2	0.169	O_2 5.457
CO	0.0	0.000	N_2 0.325	9.7	7.183	N_2 2.154
CH_4	65.8	15,200	30.053	37.1	15.700	30.861
C_2H_6	31.1	13.500		0.0	0.000	
H_2	0.0	0.000		46.6	2.470	
N_2	0.8	0.325		2.9	2.154	

The above analysis of reformed gas shows no ethane present, although all tests of natural gas showed an average of nearly 30%. This condition is typical and indicates the breaking down of all ethane during the reforming process. In the reforming of the above natural gas, the decomposition of 54.7%, or 171 cubic feet of ethane, absorbs 20,900 B.t.u. Of the 658 cubic feet of methane present, per one thousand cubic feet, 54.7%, or 359 cubic feet, enter the generator in producing one thousand cubic feet of reformed gas. On analyzing the reformed gas, it is found that 371 cubic feet of methane per one thousand cubic feet are present. This accounts for slightly more than the volume of methane taken direct from the natural gas. However, the difference is so slight that it may be considered that the chemical composition in this reforming process was principally confined to the decomposition of the ethane to carbon and hydrogen. Such of the methane, received direct from the natural gas, as is decomposed, is slightly more than replaced by the methane resulting from the partial breaking down of the ethane. It is also to be observed that carbon monoxide is present in the reformed gas to the extent of 97 cubic feet per one thousand cubic feet. This was produced from the oxygen carried by air and steam entering the generator and the carbon on the checker brick and liberated 26,800 B.t.u.

Chemical Changes Involved

The net result of these more important chemical changes involved in the production of one thousand cubic feet of 599 B.t.u. reformed gas is therefore the liberation of 5,900 B.t.u., this being the difference between the 20,900 B.t.u. absorbed by the decomposition of the ethane and the 26,800 B.t.u. liberated by the formation of the carbon monoxide. This heat, together with that stored in the brickwork, is used to raise the gases to the necessary temperatures and to meet radiation and mechanical losses. The raising of one thousand cubic feet reformed gas to generator temperature absorbs approximately 53,500 B.t.u. Further, there is absorbed about 1,000 B.t.u. by the expansion of the "make" gas leaving the supply pipe line at high pressure and entering the generator at low pressure.

Fuel consumed per one thousand cubic feet of 600 B.t.u. reformed gas amounted to about 225,000 B.t.u. of natural gas. In addition, there was the deposit on bricks and the subsequent combustion of approximately 4.3 pounds of carbon per one thousand cubic feet, yielding 62,500 B.t.u., thus making a total generator fuel of 287,500 B.t.u. per one thousand cubic feet made. The exposed brickwork in each generator shell approximates 470,000 pounds. Operating with a 300° F. temperature variation, a total heat content of about 22,000,000 B.t.u. is involved per run in making 75,000 cubic feet of gas, or an average per thousand of 293,500 B.t.u. Other investigations indicate that with large types of machines, such as here used, there is an efficiency of heat absorption of, roughly, 50%. As the total heat put into the machine approximately equals the heat content of the brickwork within the temperature range of 300°, and if the heating process is only 50% efficient, it then appears that only the outer layers of the brick, or 50% of it, are working to full capacity.

Analysis of Varying B.t.u. Quality of Reformed Gas

A comparative analysis of the effect of varying the B.t.u. quality of the reformed gas produced from a practically uniform quality of natural gas may be most readily made by reference to the accompanying charts.

Figure No. 1 presents a comparison of the cubic feet of fuel and "make" natural gas required to produce one thousand cubic feet of reformed gas of the several qualities indicated. It will be noted that as the quality increases, the amount of fuel gas per one thousand made decreases, while the amount of "make" gas increases, with a combined result that the quality of fuel and "make" gas required per one thousand cubic feet of reformed gas made is nearly constant.

Figure No. 2 shows thermal efficiencies computed upon the basis of total B.t.u. in the natural gas put into the generators, compared with the total B.t.u. of the reformed gas made. Two curves are shown, the upper one being the gross efficiency indicating the ratio of B.t.u. of the "make" gas only, compared with B.t.u. of reformed gas made, while the lower curve indicates net efficiency, which is an over-all figure of total B.t.u. of fuel and "make" gas compared with B.t.u. of reformed gas. It will be noted that for 700 B.t.u. quality of reformed gas, the gross efficiency fell to a very low point. Consideration of all observational data indicates the cause of this to

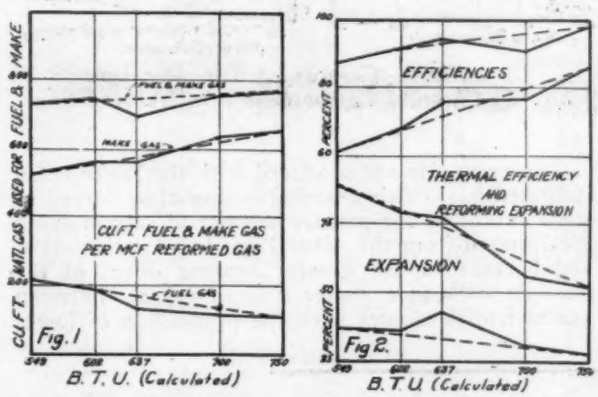


Fig. 1—Fuel and Gas Required to Make Reformed Gas.
Fig. 2—Thermal Efficiency of Process

have been the overloading of the generators when making 700 B.t.u. gas. This condition is very plainly indicated by Figure No. 3, which shows a rate of introduction of "make" gas averaging 145,600 cubic feet per hour, which even exceeds the corresponding rate of introduction when making 750 B.t.u. gas.

Figure No. 2 also shows the percent of expansion of the natural gas during the reforming process, the gross expansion representing the relation between the volume of "make" gas to volume of reformed gas, while the net expansion includes the volume of both fuel and "make" gas. A high net expansion for 637 average B.t.u. gas is shown, resulting partly because of low use of fuel gas per one thousand made at this quality. A low gross expansion at 700 B.t.u. was experienced due to overloading the generation, as above mentioned.

High Thermal Efficiencies Obtained

It is interesting to note the high thermal efficiencies set forth on Figure No. 2, as compared with oil gas operations. Practically all of the value of the "make" gas is retained in the reformed gas of the higher B.t.u. qualities. Only a small amount of carbon is carried out of the machine, as shown in the tabular statistics of the tests. The following tabulation presents a comparative chemical study of the natural gas used and the 750 B.t.u. reformed gas made from it.

On studying the above analysis, it appears that there are relatively small changes between the ultimate analyses of the natural and the reformed gas made, the principal loss being carbon. Because of the rather simple chemical reactions involved, it is possible, with reasonable accuracy, to study the changes which occur in the reforming process. It is noted that there is an increase in N_2, thus indicating the admission of some air into the generator. This, of course, carries with it the usual amount of O_2. The large increase in per cent of CO demands accounting for more O_2 than that carried by the air leakage. The balance of this O_2 is accounted for

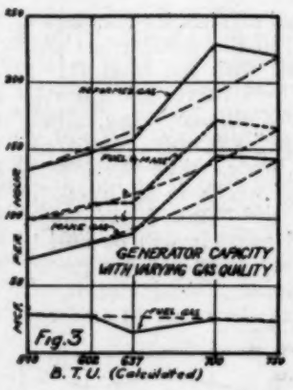
Quantitative Chemical Comparison of 655 Cu. Ft. of 1,175 B.t.u. Natural Gas Used to Produce 1,000 Cu. Ft. of 750 B.t.u. Reformed Gas

	Equivalent Reforming Quantities						
	Natural Gas 655 Cu. Ft.—1175 B.t.u.				Reformed Gas 1,000 Cu. Ft.—750 B.t.u.		
	Lbs. Per Cu. Ft	% by Volume	Total Cu. Ft.	Total Pounds	% by Volume	Total Cu. Ft.	Total Pounds
CO_2	.11637	1.3	8.5	0.989	1.1	11.0	1.163
CnH_2n	.07410	0.9	5.9	0.437	5.1	51.0	3.780
O_2	.08463	0.1	0.65	0.055	0.1	1.0	.086
CO	.07407	0.0	0.0	0.000	4.4	44.0	3.260
CO_4	.04234	70.1	459.0	19.435	50.3	503.0	21.300
C_2H_6	.07940	26.8	175.0	13.900	0.0	0.0	0.000
H_2	.00530	0.0	0.0	0.000	36.7	367.0	1.945
N_2	.07429	0.8	5.2	0.386	2.3	23.0	1.708
				35.202			33.242
Ultimate Analysis				Pounds			Pounds
C				26.237			20.929
H_2				7.707			7.810
O_2				0.874			2.795
N_2				0.386			1.708
			Total	35.202			33.242

from steam entering the machine. The H_2 from this steam accounts very closely for the small increase of this element. A rough check was made of the carbon carried by the wash box water; this amounted to 0.58 pounds per M. cu. ft. reformed gas of 750 B.t.u. The ultimate analyses show a loss of 5.308 pounds per M., thus indicating the deposit of 4.728 pounds of carbon per M. upon the checker brick which is consumed during the blasting period. Reference to volumetric analysis indicates the synthesis of a material amount of olefin hydrocarbons. It is quite possible that this occurs in the decomposition of ethane or higher paraffin hydrocarbons.

Curve Sheet of Analyses

Figure No. 4 presents graphically the trend of curves plotted from the following analyses, and showing the changes in the combustible constituents of the reformed gases of different heating values. It appears that the change of composition of the gases with change of B.t.u. value follows nearly straight lines. The hydrogen constituent decreases with increased B.t.u., because of less decomposition of the natural gas, and correspondingly the methane percentage increases with the higher heat values. It is noted that relatively large amounts of carbon monoxide are produced with the lower B.t.u. reformed gas. This reaction is doubtless forced to some extent by the greater amount of carbon being precipitated from the natural gas in an active state, and because of the greater heating effect of the checker brick as a longer time of contact between gas and brick occurs with the production of lower



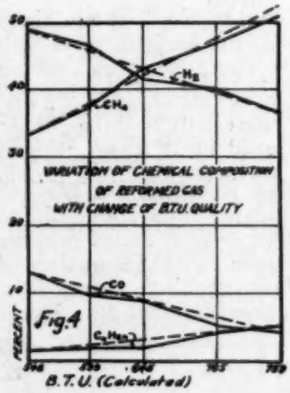


Fig. 3—Capacity of Generator
Fig. 4—Chemical Composition of Reformed Gas

Los Angeles Gas & Electric Corporation—Summary of Natural Gas Reforming Tests

Line	Item	Average B.t.u. Quality 550	602	637	700	750
1.	Dates	6–11	20–28	12–16	18–23	24–26
2.	Reformed Gas Made, M. C. F.	13411	14181	16050	16994	19367
3.	Natural Fuel Gas Used, M. C. F.	2841	2698	2206	1974	2144
4.	"Make" Gas Used, M. C. F.	7010	7889	9031	10859	12666
5.	Total Fuel and Make Gas, M. C. F.	9821	10587	11237	12833	14810
6.	Cu. Ft. Fuel Gas per M. Reformed	211.8	190.3	138.7	116.1	110.7
7.	Cu. Ft. Make Gas per M. Reformed	522.5	556.1	562.4	639.0	654.0
8.	Cu. Ft. Fuel and Make Gas per M. Reformed	734.3	746.4	701.1	755.2	765.0
9.	Expansion, Gross "Make" only	1.913	1.798	1.777	1.565	1.529
10.	Expansion, Net Fuel and Make	1.361	1.340	1.426	1.324	1.308
11.	B.t.u. of Natural Gas Used	1206	1186	1204	1216	1175
12.	B.t.u. of Reformed Gas Made	549	602	637	700	750
13.	M³ B.t.u. of Total Fuel Gas	3430	3200	2656	2404	2152
14.	M³ B.t.u. of Total Make Gas	8460	9360	10875	13203	14880
15.	M³ B.t.u. of Total Fuel and Make Gas	11890	12560	13531	15607	17032
16.	M³ B.t.u. of Reformed Gas	7360	8540	10230	11890	14510
17.	Thermal Efficiency, Gross	87.0	91.2	94.1	90.1	97.5
18.	Thermal Efficiency, Net	61.9	68.0	75.6	76.2	85.2
19.	Generator Operating Hours	99.4	96.4	101.6	74.6	88.2
20.	Fuel Gas per Generator Hour	28.6	28.0	21.9	26.5	24.3
21.	Make Gas per Generator Hour	70.5	81.8	88.9	145.6	143.7
22.	F. & M. Gas per Generator Hour	99.1	109.8	110.8	172.1	168.0
23.	Reformed Gas per Generator Hour	134.9	147.1	158.0	227.8	219.7
24.	Temperature Off Take	1320	1325	1335	1325	1300
25.	Temperature Off Take	1585	1575	1585	1620	1600
26.	Spec. Gravity Natural Gas	.722	.718	.708	.724	.697
27.	Spec. Gravity Reformed Gas	.410	.412	.419	.430	.429
28.	Naphthalene Grains per 100 cu. ft.	38	41	41	46	45
29.	Carbon, lbs. per M. Reformed	1.23	1.32	.99	.68	.58
30.	% CH_4 in Reformed Gas	33.0	40.0	44.3	46.8	50.3
31.	% H_2 in Reformed Gas	48.3	43.3	40.9	40.0	36.7
32.	% CO in Reformed Gas	13.6	9.7	8.9	5.4	4.4

quality of gas. At 548 B.t.u., the analyses indicated the presence of 132 cubic feet of CO, or 9.78 pounds, in which there was 5.58 pounds of oxygen. The total oxygen content of the original natural gas averaged about 1.35 pounds per M. cu. ft. However, materially less than one M. cu. ft. of natural gas was used in all cases to produce one M. cu. ft. of reformed gas. The production of olefins appears to be a synthetic reaction, increasing with the higher qualities of reformed gas, possibly as an intermediate decomposition product of the breaking down of higher paraffins, without exposure to extreme heating from checker brick.

Analyses of Reformed Gases
B.t.u.

	548	599	645	705	759
CO_2	2.4%	1.4%	1.7%	1.4%	1.1%
C_nH_{2n} ...	1.6	2.1	2.3	4.3	5.1
O_2	0.2	0.2	0.2	0.1	0.1
CO 13.2		9.7	9.3	5.4	4.4
CH_4 .....33.2		37.1	42.9	46.8	50.3
C_2H_6	0.0	0.0	0.0	0.0	0.0
H_2 .....48.6		46.6	41.6	40.0	36.7
N_2	0.8	2.9	2.0	2.0	2.3
Date ...June 6		May 23	June 16	June 21	June 26

Conclusion

Inasmuch as this series of tests relative to the reforming of natural gas has not been completed as yet, no attempt is made to draw definite conclusions as to the most desirable quality of gas to produce. In Los Angeles, many practical factors enter into such a decision, because of wide variations of natural gas quality and supply for both reforming and mixing purposes, and also great fluctuations of gas sendout. Certain cases have been reported where much difficulty was experienced with naphthalene when producing high B.t.u. reformed gas. Apparently this should not be the case with proper operating conditions in the generator tested. A point noteworthy of mention here, in connection with high B.t.u. values, was the production of tar in relatively large quantities when reforming to 750 B.t.u.

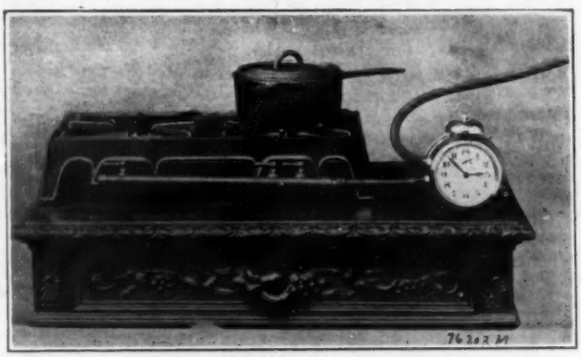
In summing up the tests as here reported, it may be stated that the thermal efficiency of the process and the capacity of the generators materially increases with increase of heat value, while the volume of natural gas required per M. cu. ft. of reformed gas made is fairly constant.

(Continued from page 427)

like the situation of the regular merchant who may follow such a plan of merchandising, the company finds itself dealing with its regular customers. In the rejection of merchandise contracts, when in the opinion of the manager the prospective purchase is an unsafe credit risk, or in instances where it is necessary to repossess merchandise upon which the purchaser is unable to complete payments, the fact cannot be overlooked that the individual continues to be a service customer of the company. This fact should guide a merchandising department in its campaigns for increased volume of sales in scattered territories where there may be a question as to the credit condition of the community, as revealed by its general business or industrial inactivity. To insist upon increased sales to the extent that the manager, in his desire to produce results, relaxes in his credit requirements, is to create a situation which may cause friction with customers and must be met with the realization of its effect upon public relations. The investment department, whose successful operation is dependent to a large extent upon the confidence of the public, is, by the very nature of its activity, one that contributes materially to the promotion of better relations between the customers and the company.

Advertising

A phase of the stock selling activity which has been closely observed by a number of managers is that of the various forms of advertising used and the reactions to them by certain groups or classes of customers. Stock advertising used for general distribution and display throughout a community should be planned with a view not only of its appeal to the small investor, but with consideration as well for its effect upon the majority of the public, this being the major institutional advertising of the utility company. To emphasize too strongly the size and extensiveness of the company is to provide the radical elements of the small community with information which, coupled with some of the misinformation of the advantages of the super-power development, causes them to question the fairness of prevailing rates.



HOUSEKEEPING MADE EASY—THE MAGIC ALARM CLOCK CONTROLS GAS WHILE HOUSEWIFE GOES SHOPPING

Here's a new invention that permits the housewife to go out and leave the gas of the cooking range lighted. The "magic alarm clock," attached as shown, is set for the number of minutes which the food under preparation has to cook, and when those minutes have elapsed the alarm rings and, by the vibrations of the bell, the gas is automatically turned off. It is a French invention and is called "Reveil Magique."

Current Market Prices

COALS (By Courtesy of Coal Age)

A. Bituminous.

(Spot prices, F. O. B. mines, net tons)

High Volatile, Eastern	Market	Price
Pool 54-64 (Gas Standard)	New York	$1.40 to $1.60
Pittsburgh screened gas	Pittsburgh	2.30 to 2.50
Pittsburgh gas, mine run	Pittsburgh	2.10 to 2.25
Kanawha lump	Columbus	2.00 to 2.25
Kanawha mine run	Columbus	1.35 to 1.50
West Virginia lump	Cincinnati	1.85 to 2.25
W. Virginia gas, mine run	Cincinnati	1.40 to 1.50
Midwest		
Indiana 4th vein lump	Chicago	2.50 to 2.75
Indiana 4th vein mine run	Chicago	2.25 to 2.50
South and Southwest		
Big Seam lump	Birmingham	2.40
Big Seam mine run	Birmingham	1.50 to 2.00
Southeast Kentucky block	Louisville	2.00 to 2.40
Southeast Kentucky mine run	Louisville	1.15 to 1.50

B. Anthracite

(Spot prices, F. O. B. mines, gross tons)

Market	Freight Rates	Independent	Company
Egg New York	$2.34	$8.50 to $8.85	$8.35 to $8.60
Egg Philadelphia	2.39	8.60 to 9.30	8.40 to 8.60
Egg Chicago (net tons)	5.06	7.86 to 8.50	7.44 to 8.18

COKE (By Courtesy of Iron Trade Review)

Connellsville, furnace	$3.00 to $3.25
Wise County, furnace	3.75 to 4.25
Alabama, furnace	4.00 to 4.50
Foundry, Newark, N. J., del.	10.41
Foundry, Chicago, ovens	10.75
Foundry, Boston, delivered	12.00
Foundry, St. Louis	11.00
Foundry, Granite City, Ill.	9.00
Foundry, Alabama	5.00

PETROLEUM

(By Courtesy of Oil, Paint and Drug Reporter)

(Prices at wells, per bbl.)

Pennsylvania—Ohio—West Virginia	
Cabell, West Virginia	$2.05
Corning, Ohio	1.80
Lima	2.33
Pennsylvania	$3.15 to 3.40
Wooster, Ohio	2.15
Indiana—Illinois	
Illinois	2.02
Indiana	2.03
Oklahoma—Kansas	
Mid-continent (low gravity)	1.35
Gulf Coast	
Gulf Coast, Grade A	$1.75
Gulf Coast, Grade B	1.50

GAS OILS

Gas Oil, Bayonne, bulk, gal.	6¾c
Gas Oil (32-36), Oklahoma, gal.	2¾ to 3c
Gas Oil (32-36), Gulf Coast, gal.	4¾ to 5c

PIPE AND FITTINGS—CAReview)

(By Courtesy Iron Trade ST IRON GAS PIPE

Four-inch, Chicago	$55.20 to $57.20
Six-inch and over, Chicago	51.20 to 53.20
Four-inch, Birmingham	47.50 to 49.50
Six-inch and over, Birmingham	43.50 to 45.50
Four-inch, New York	62.50 to 63.50
Six-inch and over, New York	57.50 to 58.50
Standard fittings, Birmingham, base	115.00

6 to 24-inch, base; over 24-inch, plus $20; 4-inch, plus $20; 3-inch, plus $20.

BY-PRODUCTS

(By Courtesy of Oil, Paint and Drug Reporter)

Ammonia aqua, 16 deg. drums, lb.	5 to 5¼c
Ammonia aqua, 20 deg. drums, lb.	6¼ to 6½c
Ammonia aqua, 26 deg. drums, lb.	6½ to 6¾c
Ammonia aqua, anhydrous cylinder, lb.	30 to 36 c
Ammonium sulphate, bulk, delivered Northern markets, per 100 lbs.	$2.85 to $2.90
Ammonia sulphate, bulk, delivered Southern markets	$2.95 to $3.00
Potash Prussiate, yellow casks	18 to 18½c
Potash Prussiate, red casks, lb.	37 to 37½c
Soda Prussiate, yellow casks	10¼ to 10½c
Soda Sulphocyanide, barrels, lb.	45 to 55 c

COAL TAR BASIC PRODUCTS

(By Courtesy of Oil, Paint and Drug Peporter)

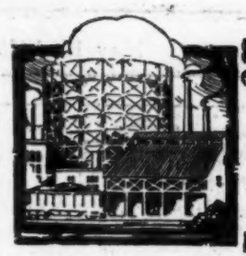
Benzol C. P. tanks, works, gal.	23c
Benzol, drums, gal.	28c
Benzol, 90% tanks, works, gal.	21c
Benzol, 90% drums, gal.	26c
Naphthalene, flake, barrels, lb.	5¼ to 5½c
Naphthalene, dyestuff bags, lb.	5 to 5½c
Solvent Naphtha, water white, works, gal.	24 to 25c
Solvent Naphtha, drums, works, gal.	30c
Toluene, C. P. tanks, works, gal.	26c
Toluene, C. P. drums, works, gal.	31c

Coal

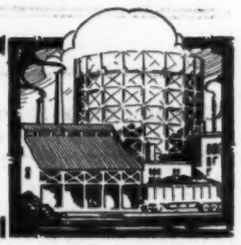
There was little change in the rate of output of bituminous coal in the week ended May 2, when, according to the Geological Survey, 7,964,000 net tons were produced, compared with 8,029,000 tons in the preceding week, as shown by revised figures Anthracite production in the week ended May 2 was 1,984,000 net tons, as against 1,937,000 tons in the preceding week.

Gas Oil

Gas oil was meeting with a fair call, the market being held at 6¾c per gallon, in bulk f.o.b. Bayonne refineries. The daily average production of gas and fuel oils in the United States during March, according to the Bureau of Mines, was 38,835,665 gallons, a record figure. Domestic demand for these oils was 1,118,000,000 gallons, a daily average of 36,070,000 gallons. Stocks on hand showed comparatively little change during the month and stood at 1,648,000,000 gallons on April 1.



NEWS OF THE GAS INDUSTRY



Distribution Conference to Meet in Detroit

Members of the American Gas Association interested in distribution subjects have been invited to attend a two-day Distribution Conference at the Book Cadillac Hotel, Detroit, Mich., June 11 and 12.

The conference held in Toronto last year, at which many distribution problems were informally discussed, proved to be of such value to the members of the Distribution Committee in attendance that it has been decided to make the benefits of the present year's conference available to all distribution men who are able to attend it. The purpose of the conference is to afford the distribution engineers an opportunity thoroughly to discuss in the two days' sessions the most vital distribution problems which are at present being considered by the committee and to discuss further the distribution matters taken up at the last annual convention of the association for the discussion of which there was insufficient time available.

The Program

For the program of the conference the Distribution Committee has selected the following general topics as the most important and pressing to the distribution engineer at the present time:

1. Distribution Design (including consideration of the effect of house-heating on the load factor).
2. Pipe Joints.
3. Pipe Materials.
4. Labor-saving Machinery Used in Distribution Work.

On the above four main topics there will be available summarization of the data presented by 43 different gas companies to the Distribution Committee this year, including all phases of the main topics outlined. It is planned at the conference to concentrate on these topics, but there will also be considered and further discussed the paper on "High Pressure Transmission and Distribution," presented by R. S. Fuller at the last annual convention of the association. Other distribution subjects presented by members attending will be given time for consideration.

Conference to Be Informal

The conference will be entirely an informal one, so that the members can discuss their experiences thoroughly. While standardization of distribution work is probably not possible in its entirety, it is felt that through the holding of this and similar conferences there may be assembled in report form the many factors which should be taken into consideration by any distribution man having to select the proper design and material for his local condition.

It is also believed that more progress can be made in distribution work at the annual convention by having many of the preliminary details of the committee's report first assembled in an intelligent manner for discussion at the preliminary conference, and this will allow more time for the discussion of the vital factors at the convention itself.

Special reservations have been made for 150 members at the Book Cadillac Hotel, and the association is obtaining the advantage of convention rates for the conference. Members planning to attend the conference should send their requests for hotel reservations to the association. The Book Cadillac Hotel in Detroit, opened December 8, 1924, has every luxury and convenience and is especially equipped for conferences and conventions. The Detroit City Gas Company is planning an extensive main-laying program in order to keep pace with the city's growth, and all attending members may be assured of a most instructive and pleasant trip.

Gas Sales Stimulation Issues Last Bulletin of Year's Work

The last bulletin of the year's work of the Gas Sales Stimulation Committee has been issued. It contains a plan for the Second Spring Campaign on Water Heating, a Gas Range Baking Contest and Sales Drive and three items in the Home Service Department, one being an article on "How and Why Home Service Work Pays in the Smaller Cities," another being on the "Work Done by the Hyde Park Gas Company at Scranton, Pennsylvania," and the third being on "Home Service from a Manufacturer's Point of View."

Prominent Gas Men to Lecture at Johns Hopkins

The following lectures on gas subjects will be delivered at the Johns Hopkins University, under the auspices of the School of Engineering:

Wednesday, March 25——"Coal Carbonization and the Manufacture of Gas," Mr. C. J. Ramsburg, vice-president, the Koppers Co., Pittsburgh, Pa.

Wednesday, April 1—"The Distribution of Gas," Mr. A. Hurlburt, vice-president, the Equitable Gas Co., Pittsburgh, Pa.

Monday, April 20—"The Utilization of Gas," Mr. Henry O. Loebell, vice-president and general manager, the Combustion Utilities Corporation, New York City.

Wednesday, April 29—"The Low Temperature Carbonization of Coal," Mr. A. C. Fieldner, superintendent Pittsburgh station, U. S. Bureau of Mines.

Utilities Power Buys Clinton Co.

H. L. Clarke, president of the Utilities Power & Light Corpora tion, has announced that the corporation has acquired control of the Clinton Gas & Electric Co. The latter supplies electric lighting, power and gas to Clinton, Iowa, and sells electrical energy wholesale to three other utility companies serving towns and villages in Iowa and eastern Illinois.

In addition to the properties in the states mentioned above, the Utilities Power & Light Corporation controls the Eastern New Jersey Power Company, the Atlantic Coast Transportation Company, Electric Power & Light Co. of Hightstown, N. J., Jamesburg Electric Company and the Colonial Gas & Electric Co. of Newport, R. I. The corporation also has a valuable equity in the Utilities Building Corporation of Chicago. Ninety per cent of the net income of its properties comes from the sale of electric power and light and the balance from gas, steam heat and water.

Ohio Gas Merger Soon

A merger of gas properties in and around Lima, Ohio, is to be effected as the result of the sale to Halsey, Stuart & Co. of New York of $1,000,000 first and refunding 6 per cent bonds, series A, by the West Ohio Gas Co. last October.

Properties of constituent companies which heretofore have been engaged in supplying both natural and artificial gas to Lima and natural gas to Cridersville, Wapakoneta, St. Mary's and Celina, are to be acquired. These systems, serving a population of 75,000, have been interconnected and brought under unified operation, which makes possible the distribution of an economical mixture of natural and artificial gas. The consolidated company will be under the Midland Utilities Co. management. Samuel Insull is chairman of the board.

Northampton Gas & Electric Companies Building New Office Building

The new office building which is being built for the Northampton Gas & Electric Compaies is progressing rapidly. Owing to the unusually favorable construction weather, the concrete foundation and retaining walls have been completed and brick and steel construction has started.

The building will be a three-story brick structure with concrete floors and roof. On the main floor will be located the general offices, the manager's office and display room. The second floor will house the electric meter department, the drafting room and library and reading room, also a large space for the storage of gas and electric appliances. On the lower floor will be located the gas meter department, plumbing shop and the electric line department. An electric freight elevator will serve all floors. The front of the building will be tapestry brick with stone trim. Large circle top windows will furnish abundant light for the general office and display room. The building was designed by Edward L. Rawson, of Boston, and the general contractor is John R. Wennergren, of Northampton.

Chemical Engineering Bulletin Issued by Univ. of Mich.

The University of Michigan has just issued a bulletin descriptive of its chemical engineering department which includes courses in gas engineering. Facilities are at hand at the university for practical instruction in chemical engineering and also for research work relating to the manufacture, properties and uses of coal gas, water gas, oil gas and producer gas.

D. G. Munroe Joins Koppers Construction Company

The Koppers Construction Company announces the appointment of Mr. Donald G. Munroe as district engineer in charge of its New York office, 1750 Equitable building, 120 Broadway, New York City.

New Gas Rates for Saratoga Springs

Albany, N. Y.—The Public Service Commission has approved the schedule of the Adirondack Power & Light Corp., effective May 16, for gas service supplied in the city of Saratoga Springs, N. Y., providing rates as follows for use of service for residence heating, limited period (between September 1 and May 31): For first 250 cu. ft. of gas used per month per 1,000 cu. ft. of building volume, $2 per M. cu ft.; for next 20,000 cu. ft., 70 cents per M. cu. ft.; for all additional use per month, 65 cents per M. cu. ft. of gas for each 1,000 cu. ft. of building volume. Changes will operate to effect reductions.

The Consumers Gas Co. Issues Bulletin for Architects, Builders, Etc.

The Consumers Gas Co. of Toronto, Canada, has issued a very attractive bulletin giving some very useful information for architects, builders, owners, plumbers and gas fitters. The booklet contains a series of general piping instructions for water heaters, for gas fires, for meters, for services, etc.

G. C. Shadwell to Represent Equitable Meter Company

Mr. Gilbert C. Shadwell, who has recently resigned from the Surface Combustion Company and made connections with various manufacturers of gas equipment, will also represent the Equitable Meter Company, manufacturers of gas meters, regulators, gauges, etc. Mr. Shadwell, who is well known to the gas fraternity, has his office at 72 Cortlandt street, New York City.

G. C. Shadwell

Gas Company Uses the Radio

Radio communication as a means of maintaining the "personal touch" between workers and executives in big industrial enterprises was exemplified in New Jersey the other day when President Thomas N. McCarter, of Public Service Corporation of New Jersey, enlisted the services of W A A M, Newark, for the purpose of greeting through the air the some 20,000 employees of the corporation and its subsidiary companies.

Public Service is one of the largest public utility enterprises in the world. It supplies electricity, gas and local transportation to some 2,600,000 New Jersey people residing in 236 municipalities, scattered along the pathway between New York and Philadelphia. In this territory it has hundreds of plants, offices and shops, thousands of employees and more thousands of stockholders.

For the head of the enterprise to speak directly to this large personnel through the medium of meetings would consume so much time as to be entirely impracticable, yet President McCarter believes that as "members of one big family, engaged in the one big task of providing service to the public," officers and employees should know each other. The latter part of April Mr. McCarter returned from the first long vacation that he has taken since he was instrumental in organizing Public Service, back in 1903, and he had something to say to his fellow-workers—wanted to thank them for their loyalty and faithful service, point out to them plans for the future and discuss with them some of the problems of the business.

Radio was the only medium by which he could personally deliver his message, and so every Public Service radio owner was urged to tune in on Station W A A M on the evening of April 29, at 8:30 o'clock.

They did, and not only that, but they invited their Public Service friends who had no radio to listen in with them, while for those on duty receiving sets were installed at the various offices and plants.

In addition, in some of the larger places where the number of employees warranted, "radio" parties were arranged, at which President McCarter's address was made a feature of the program.

The experiment was an entire success. Reports from all sections of the State showed that the interest of the organization members had been everywhere engaged and that the six-minute talk that Mr. McCarter made had been listened to, not only by thousands of employees, but by a large number of the stockholders of the corporation and customers of its operating companies.

What this large audience meant was indicated by Mr. McCarter himself, when in the course of his remarks he said: "I have no exact idea of the number of you who are within the sound of my voice this evening. If that number could possibly include all whose names appear on Public Service payrolls, it would reach a total of more than 19,000. If our stock and bondholders, and those who own the securities of our underlying companies were added, it would mean over 100,000 more, while had I the opportunity of addressing all of those who depend upon us for their electricity, gas and local transportation service, I would have some 2,600,000 auditors, or five out of every six residents of the State."

Milan R. Bump Passes Away

Denver, Col.—Milan R. Bump, officer and director of more than 95 companies owned or controlled by Cities Service Company, and chief engineer for Henry L. Doherty & Co., died suddenly here, following a heart attack. Mr. Bump's death was entirely unexpected to his host of friends and business associates.

Mr. Bump was an engineer with the Denver Gas & Electric Light Company from 1904 to 1906 and came to the New York office of Henry L. Doherty & Co. in 1907, when he became the organization's examining engineer. In 1909 and 1910 he was general manager of the Empire District Electric Company in Joplin, Missouri. In 1910 he was made chief engineer for H. L. Doherty & Co.

O. O. Thwing Passes Away

Orrel Orsen Thwing, who was associated with the gas industry for 38 years, recently passed away. Mr. Thwing was a graduate of Wesleyan University and entered the gas business at Topeka, Kansas, in 1887. He was associated with the Laclede Gas Company, St. Louis, from 1891 to 1895 and then became superintendent of the Milwaukee Gas Company, returning to St. Louis in 1905 as superintendent of all of the plants. Until 1906 he was superintendent of the West Works in Cincinnati

O. O. Thwing

and until 1917 chief engineer and general manager of the Western Gas Construction Company. Then he became the chief engineer of the Steere Engineering Company of Detroit, remaining with that organization until 1921. The next year he was a consulting engineer in Chicago, and from 1922 to the time of his death the general manager of the General Oil Gas Corporation, New York City.

Mr. Thwing was active in organization work and at one time was a member of the Western Gas Association. He was also a charter member of the American Gas Association. While with the Western Gas Association he edited the well-known book on "Wrinkles."

Graduate Assistantship in Gas at Johns Hopkins

The School of Engineering of Johns Hopkins University will award a graduate assistantship in gas engineering for the academic year 1925-26. This assistantship will pay the holder $500. In return he will be required to spend a number of hours each week assisting in the undergraduate laboratory instruction in gas and fuel technology.

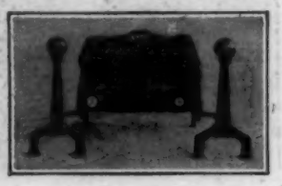
Applicants for this assistantship must be candidates for advanced degrees in gas engineering, and the holder will be expected to pursue advanced instruction and research in this field.

Persons desiring to submit applications or secure further information should address their applications to Wilbert J. Huff, professor of gas engineering.

U. S. Patent Issued on Radiantlog

Mr. J. P. Conroy, of 44 Murray street, New York, on April 14 was granted a U. S. letter patent No. 1,533,391 on a Radiantlog.

Radiantlog is so constructed that the front part of the bar is made of a refractory material. The high part of the bar is left intact, while the low part is cut through into



the channel so that when the log is lighted up it instantly glows to a red-hot mass, imitating perfectly the true live coal embers of a wood fire, giving off firelight effect and wonderful radiant heat energy and at the same time when the log is not burning it has every appearance of a neat set of logs in the fireplace. These logs are built in all lengths to fit all sizes of fireplaces.

Gas Company and Its New Franchise

While the franchise of the Public Service Company of Colorado, Denver, does not expire until May, 1926, Clare N. Stannard, vice-president and general manager, is making overtures to present to the voters in the May, 1925, election, the question whether or not the Public Service Company is to be given a new franchise.

One of the main reasons for submitting the question at the 1925 election is to obviate the necessity of a special election in 1926.

There is no question about it, the franchise renewal will be granted, but civic and commercial clubs are divided as to the justice and equity of a clause therein by which the company can change its rates, based upon the barometic reports of the Department of Labor. This is objectionable because such reports, if the rate is high, will work a hardship on the poorer consumers because they do not know just "which way the wind will blow." Mr. Stannard advises all that the new stipulations, which were worked out by Henry L. Doherty and his engineers, will mean a saving to the consumers, and that the company binds itself to serve natural gas whenever it is practicable to do so, and this would be a further saving.

Gas Rates Compared

New franchise—On meter basis, $1 a thousand feet with 10 per cent discount for payment in ten days; net rate, 90 cents; minimum bill, 25 cents a month a meter.

Old franchise—$1.10 a thousand; net rate, $1; minimum bill, 25 cents a month per consumer.

New franchise—On readiness-to-serve basis, on yearly contracts, not exceeding $9 a year per consumer, plus $3 per ten cubic feet of maximum hourly demand, plus 70 cents per 1,000 cubic feet for gas consumed, with 10 per cent discount for payment in ten days.

Old franchise—Same.

The Triad

This is the name of the official organ of the Public Service Company of Colorado, the first number of which has just been issued. This publication will be issued semi-monthly. The introduction to the Triad is written by Mr. Clare N. Stannard, vice-president and general manager of the company, who explains the purpose of the paper and the service it will render to the employees of the company.

Contracts Awarded

The contract for a new water gas set for La Porte, Indiana, has been awarded to the Western Gas Construction Company of Fort Wayne, Indiana, by the La Porte Gas & Electric Company. The contract calls for a 6x5x5 foot water gas set, hand operated hydraulic control, with the necessary steel plate operating floor.

The U. G. I. Contracting Company of Philadelphia has been awarded a contract by the Illinois Power and Light Corporation for the installation of additional equipment at the plant in Centralia, Ill. The equipment to be installed will include a cone top carburetted water gas apparatus, having capacity of 1,230 M. cu. ft. per day. The apparatus will be equipped with back run connection and will be hydraulically operated. Likewise, it will be equipped with the U. G. I. process for the use of soft coal.

The U. G. I. Contracting Company of Philadelphia has been called upon to furnish and install the U. G. I. automatic controls at the plant of the Public Service Electric and Gas Company at its Camden, N. J., plant. Also at the plant of the Connecticut Power Company at New London, as well as on the blue gas apparatus installed at the Erie, Pa., plant of the Perry Iron Works.

The Peoples Power Company of Moline, Illinois, has placed order with the Gas Machinery Company of Cleveland, Ohio, for an automatic control for the nine-foot water gas set which the Gas Machinery Company installed a few years ago.

The St. Paul Gas Light Company of St. Paul, Minnesota, while furnishing a large percentage of coal gas, also has an auxiliary water gas plant, and has placed order with the Gas Machinery Company of Cleveland, Ohio, for new eleven-foot water gas generating equipment.